

We claim:

1. A keratome comprising:

A) a cutter head having a body and a blade assembly,

1) the blade assembly including a blade holder having a drive track and one of a guide slot or a guide bar substantially transverse to the drive track, the blade assembly further including a blade mounted to and extending outwardly from the blade holder to a cutting edge substantially parallel to the guide slot or guide bar, and

2) the cutter head body defining

a) a sole surface for sliding engagement with a cornea, the sole surface defining a blade opening,

b) a blade holder cavity shaped to receive the blade holder in reciprocating movement, the blade holder cavity defining the other of the guide slot or guide bar, wherein the guide bar is received in the guide slot for stabilizing the blade holder in reciprocating motion in the blade holder cavity,

c) a blade slot extending between the blade holder cavity and the blade opening, wherein the blade extends through the blade slot and blade opening with its cutting edge positioned below the sole surface, the blade slot and blade opening sized to accommodate the blade without contact between the blade and the cutter head body, and

d) a drive means access to the drive track of the blade holder.

2. A blade assembly for a keratome of the type including a cutter head defining a blade holder cavity, one of a guide bar or guide slot, and a drive shaft opening to the blade cavity for receiving a drive shaft having an eccentric revolving drive pin extending into the blade cavity, the blade assembly comprising:

A) a blade holder configured for reciprocal sliding movement in the blade holder cavity of the cutter head, the blade holder defining one of a guide slot or guide bar for engagement with the guide slot or guide bar of the cutter head, the blade holder further defining a drive track substantially perpendicular to the guide slot or guide bar for receiving the eccentric revolving drive pin;

B) a blade mounted to the blade holder and extending therefrom to a blade edge substantially parallel to the guide slot or guide bar.

3. A keratome comprising:

A) a cutting instrument including a cutter head having a reciprocating blade with a cutting edge extending below a sole surface of the cutter head;

B) a suction ring including an eye ring adapted to be secured to an eye by suction and defining a cornea aperture for presenting the outer layer of the cornea of

the eye for cutting, and a shoe from which the eye ring extends, the shoe defining,

a) a cutting guideway configured for receiving the cutter head in precision mating sliding engagement when the cutting edge of the blade is positioned over the cornea aperture of the eye ring, and

b) an entrance guideway extending from and generally aligned with the cutting guideway, the entrance guideway configured for receiving the cutter head in orienting sliding engagement and positively positioning the cutter head for precision mating sliding engagement with the cutting guideway.

4. A suction ring for positioning a cutter head having a cutting blade for incising a cornea, the suction ring comprising:

A) an eye ring having first and second generally concentric spaced apart surfaces sized and shaped for engaging the eye on or adjacent the cornea thereof, the eye ring defining within the concentric spaced apart surfaces a cornea opening exposing a central portion of the cornea when the eye ring is engaged with the eye, the eye ring defining a suction channel between the first and second concentric eye engaging surfaces, and a secondary distribution channel extending inwardly from the suction channel, and

B) a stem extending from the eye ring and having an opening for communicating suction with the eye ring,

the stem opening intersecting the suction channel and secondary distribution channel.

5. An apparatus for sizing an eye prior to incising the cornea of the eye and for coordinating the corneal incision with eye size, comprising:

A) a suction ring having an eye ring for engaging the eye on or adjacent to the cornea, the eye ring defining a cornea aperture exposing a central portion of the cornea;

B) a shoe extending from the eye ring, the shoe having a bottom wall surrounding the cornea aperture and an applanator socket extending upwardly from the bottom wall surrounding the cornea aperture; and

C) an applanator removably received in the applanator socket, the applanator having a sizing surface which, when received in the socket, is positioned adjacent to and above the cornea aperture, wherein a cornea presented in the cornea aperture extends to contact the applanator sizing surface, and the applanator sizing surface includes indicia indicating the size of the contact between with the cornea and the applanator sizing surface.

6. A keratome comprising:

A) a cutting instrument including a cutter head having a reciprocating blade with a cutting edge extending below a sole surface of the cutter head;

B) an automated drive unit mounting the cutting instrument for powered translational movement of at least the cutter head thereof;

C) a suction ring including an eye ring adapted to be secured to an eye by suction and defining a cornea aperture for presenting the outer layer of the cornea of the eye for cutting, and a shoe from which the eye ring extends, the shoe defining,

1) a cutting guideway configured for receiving the cutter head in precision mating sliding engagement when the cutting edge of the blade is positioned over the cornea aperture of the eye ring, and

2) an entrance guideway extending from and generally aligned with the cutting guideway, the entrance guideway configured for receiving the cutter head in orienting sliding engagement and positively positioning the cutter head for precision mating sliding engagement with the cutting guideway;

D) said automated drive unit and said suction ring configured for releasable attachment when said cutter head is received in the entrance guideway of the suction ring, and

E) said automated drive unit operable to slidably translate the cutter head into the cutting guideway and to withdraw the cutter head therefrom.

7. A keratome as defined in claim 6 wherein the cutter head has a body and a blade assembly,

1) the blade assembly including a blade holder having a drive track and one of a guide slot or a guide bar substantially transverse to the drive track, the blade assembly further including a blade mounted to and extending outwardly from the blade holder to a cutting edge substantially parallel to the guide slot or guide bar, and

2) the cutter head body defines

a) a sole surface for sliding engagement with a cornea, the sole surface defining a blade opening,

b) a blade holder cavity shaped to receive the blade holder in reciprocating movement, the blade holder cavity defining the other of the guide slot or guide bar, wherein the guide bar is received in the guide slot for stabilizing the blade holder in reciprocating movement in the blade holder cavity,

c) a blade slot extending between the blade holder cavity and the blade opening, wherein the blade extends through the blade slot and blade opening with its cutting edge positioned below the sole surface, the blade slot and blade opening sized to accommodate the blade without contact between the blade and the cutter head body.

8. A keratome as defined in claim 7 wherein the guide bar and guide slot have substantially rectangular mating configurations.

9. A keratome as defined in claim 8 wherein the guide slot has an incrementally smaller width than the guide bar, so that the guide bar is tightly received in the guide slot.

10. A keratome as defined in claim 9 wherein the guide slot is defined by the blade holder.

11. A keratome as defined in claim 7 wherein the guide slot is defined by the blade holder.

12. A keratome as defined in claim 7 wherein the cutter head is metal and the blade holder is a plastic material.

13. A keratome as defined in claim 12 wherein the blade holder is nylon.

14. a keratome as defined in claim 7 wherein the eye ring has first and second generally concentric spaced apart surfaces sized and shaped for engaging the eye on or adjacent the cornea thereof, the eye ring defining within the concentric spaced apart surfaces a cornea opening exposing a central portion of the cornea when the eye ring is engaged with the eye, the eye ring defining a suction channel between the first and second concentric eye engaging surfaces, and a secondary distribution channel extending inwardly from the suction channel, and

a stem extending from the eye ring and having an opening for communicating suction with the eye ring, the stem opening intersecting the suction channel and secondary distribution channel.

15. A keratome as defined in claim 6 wherein the suction ring has a guide hoop upstanding from the shoe thereof, the guide hoop receiving and surrounding the cutter head as it enters the entrance guideway.

16. A keratome as defined in claim 15 wherein the cutter head and portion of the cutting instrument adjacent thereto are surrounded and embraced by the hoop as the automated drive unit translates the cutter head into the cutting guideway.

17. A keratome as defined in claim 15 wherein the guide hoop provides the transition between the entrance guideway and the cutting guideway.

18. A keratome as defined in claim 15 wherein the cutter head has a toe and the shoe and guide hoop of the suction ring define flanking toe slots and toe ramps for guiding the toe of the cutter head into the entrance guideway.

19. A keratome as defined in claim 15 wherein the guide hop and cutter head are cooperatively configured to guide the cutter head into the entrance guideway.



20. A keratome as defined in claim 19 wherein the cutter head includes guide tongues depending from the edges of its sole surface, and the suction ring defines guide grooves receiving the guide tongues as the automated drive unit translates the cutter head in the cutting guideway.

21. A keratome as defined in claim 19 wherein the automated drive unit has a housing surrounding the cutting instrument, and the housing is matingly received and removably secured with the suction ring when the cutter head is in the cutting guideway.

22. A keratome as defined in claim 21 wherein the guide hoop defines a notch and the housing of the automated drive unit includes a latch removably engaged in the guide hoop notch.

23. A keratome as defined in claim 15 wherein the automated drive unit has a housing surrounding the cutting instrument, and the housing is matingly received and removably secured with the suction ring when the cutter head is in the cutting guideway.

24. A keratome as defined in claim 23 wherein the guide hoop defines a notch and the housing of the automated drive unit includes a latch removably engaged in the guide hoop notch.

25. A keratome as defined in claim 6 wherein the shoe from which the eye ring extends has a bottom wall surrounding the cornea aperture and an applanator socket extending upwardly from the bottom wall surrounding the cornea aperture, and further comprising an applanator removably received in the applanator socket, the applanator having a sizing surface which, when received in the socket, is positioned adjacent to and above the cornea aperture, wherein a cornea presented in the cornea aperture extends to contact the applanator sizing surface, and the applanator sizing surface includes indicia indicating the size of the contact between with the cornea and the applanator sizing surface.

26. A keratome as defined in claim 6 wherein the automated drive unit has a housing surrounding the cutting instrument, and the housing is matingly received and removably secured with the suction ring when the cutter head is in the cutting guideway.

27. A keratome as defined in claim 6 wherein the automated drive unit has an elongated housing and the cutting instrument includes a generally tubular body slidably mounted in the elongated housing for powered extension and retraction with respect thereto to translate the cutter head in the cutting guideway.

28. A keratome as defined in claim 27 wherein the cutting instrument has a motor that drives the reciprocating blade in the cutter head by a drive shaft, and the automatic drive unit has an additional motor that translates the cutting instrument and cutting head.

29. A keratome as defined in claim 28 wherein the tubular body of the cutting instrument has a worm gear mounted thereon, and the motor of the automated drive unit turns a threaded shaft received in the worm gear to translate the cutting instrument and cutter head.

30. A keratome as defined in claim 29 wherein the motor of the automated drive unit is reversed at the desired extent of translation.

31. A keratome as defined in claim 30 wherein one of the cutting instruments or cutter head is mechanically stopped at the desired extent of translation, thereby causing an electrical spike in the motor current used as a control signal to reverse the direction of translation.

32. A keratome as defined in claim 27 wherein the cutter head is removably secured to the cutting instrument by a bayonet mount of a cutter head mounting shank.

33. A keratome as defined in claim 32 wherein the drive shaft of the cutter head and a drive shaft of the cutting

instrument motor are connected by an axially engageable coupling that releases and engages as the cutter head is removed and secured on the cutting instrument.

34. A keratome as defined in claim 33 wherein the coupling comprises a first drive coupling members having two ears flanking two slots, and a second positioning coupling having two slots receiving the two ears of the drive coupling member and two substantially pointed ears guiding the engagement of the coupling.

35. A blade insertion tool for a keratome cutter head defining a traverse blade holder cavity and blade slot for receiving a blade assembly having a blade holder and blade, the cutter head also having a retractable drive shaft with a drive pin extending into the blade holder cavity for engaging and driving the blade assembly and defining a drive shaft access slot adjacent the blade holder cavity, the blade insertion tool comprising:

A) a shaft retractor and blade holder having

1) a shaft retractor top insertable in the drive shaft access slot and configured to engage and retract the drive shaft from the blade holder cavity, and

2) a blade assembly support surface which, when the shaft retractor tip is inserted in the drive shaft access slot, is positioned to support a blade

assembly with its blade holder adjacent the blade holder cavity and its blade adjacent the blade slot; and

B) an injector slidably received on the shaft retractor and blade holder, the injector configured to engage the cutter assembly and slide it into the cutter head positioned for engagement with the drive shaft upon withdrawal of the shaft retractor tip.

36. A blade insertion tool as defined in claim 35 wherein the shaft retractor and blade holder is also configured to support the cutter head.

37. The blade insertion tool as defined in claim 35 wherein the injector defines a stop that butts against the cutter head when the blade assembly is in the desired position with respect to the drive shaft.

38. A blade insertion tool as defined in claim 35 wherein the injector further comprises a stop member pivotally mounted thereon for selection between

1) a first position in which the stop member butts against the cutter head when the blade assembly is in the desired position with respect to the drive shaft, and

2) a second position permitting the injector to enter the blade holder cavity and displace a blade assembly therefrom.